

# **TOWING SYSTEM AND METHOD FOR A WATER SPORTS APPARATUS**

## **Background**

Towable water sports devices are used in various recreational and professional activities. These devices include water skis, kneeboards, wakeboards, water ski boards, tubes and other devices which are towed behind a motor boat or other towing vessel along with a rider. Typically, the rider stands, kneels, or sits on the device, and a towline is held by the rider or attached to the device.

Wakeboarding, for example, is a recreational and professional sport that is rapidly increasing in popularity. In wakeboarding and other water sports, it is often desirable to jump off the water surface to add excitement to the activity, perform tricks or other aerial maneuvers, etc. Often, the wake created by the towing vessel is used as a ramp to facilitate jumping off the surface of the water. However, regardless of the amount of wake present, riders will often want to maximize the ability to jump off the water surface.

Accordingly, motor boats have been provided with elevated anchor points typically called wake towers to accommodate a higher angle of attachment of the rider towline. Typically, a pylon, tower or like structure extends several feet above the deck of the boat (e.g., approximately 8-10 feet). This slightly increases the angle formed by the rider towline with the surface of the water. The resulting upwardly directed force component allows the rider to jump higher off the water surface.

Various constraints limit the advantages obtained through use of such elevated anchor points. Typically, there are practical and other limitations on the height of

elevated anchor point structures, for example hauling or fold-away limitations. Large towers can flex significantly, requiring stabilizing guy wires or other structural reinforcements within the boat. Towers can also adversely affect the stability of the towing vessel, due to leveraged forces exerted by the rider towline on the tower, particularly when the rider pulls from one side of the motor boat. For these and other reasons, the jumping advantage provided by an elevated anchor point within a boat is limited.

### Brief Description of the Drawings

Fig. 1 depicts a water sports towing system and method according to the present description.

Fig. 2 is a partial view of the system of Fig. 1, depicting an elevated support location for the rider towline of Fig. 1.

Fig. 3 depicts an exemplary lift apparatus, such as a kite, that may be employed in connection with the water sports towing system and method of the present description.

Figs. 4A, 4B and 4C depict a method of towing a water sports apparatus according to the present description.

### Detailed Description

Fig. 1 depicts a system 10, and accompanying method, for towing a water sports apparatus/device and rider over a body of water with a towing vessel. In the depicted example, the water sports device is implemented as a wakeboard 14, though it will be appreciated that water skis or other towable water sports devices may be used with the present system and method. While standing on wakeboard 14, rider 12 is towed over

body of water 16 by a towing vessel such as power boat 18. Rider 12 typically grasps or is otherwise secured to a rider towline 20, and a lift system 22 is deployed to support a portion of rider towline 20 at an elevated location.

As indicated, lift system 22 may include a lift apparatus such as kite 24 secured to an attachment point on boat 18. In addition to or instead of kite 24, an airfoil, sail, chute and/or the like may be employed. Use of such a lift apparatus allows the rider towline to be supported so that the rider towline extends upward from the rider at a significantly steeper angle than possible when the towline is attached directly to a conventional boat-mounted anchor structure. The resulting pulling force on the rider towline thus provides a substantially increased vertical force component, enhancing the ability of the rider to jump off the surface of the water, for example by traversing and jumping the wake created by boat 18 either on toe-side or heel-side wake board rides.

Boat 18 may be a conventional power boat of the type normally used for wakeboarding, waterskiing, etc. An attachment or anchor structure 26 typically is provided within boat 18, to accommodate attachment of lines for all types of towable devices, including the kite and rider. Specifically, in the depicted example, kite 24 is connected to an attachment point on an anchor structure 26 via a line referred to as a kite towline or kite bridle line 28. As indicated, bridle line 28 tethers kite 24 to boat 18 during towing, and therefore should be of sufficient test strength to withstand anticipated tensions due to wind, acceleration of the boat, pull out of the water, etc. In addition, bridle line 28 typically floats and is lightweight so as to maximize the lifting forces provided to rider 12.

Towing force is imparted to rider 12 via rider towline 20 upon forward motion of boat 18 over body of water 16. It will be appreciated that rider towline 20 provides force components in both a horizontal direction and a vertical direction. The horizontally directed force causes rider 12 and wakeboard 14 to be conveyed horizontally over the surface of the water. The vertical force, to the extent present, enhances the ability of the rider to jump off the surface of the water, for example to perform aerial stunts or other special in-air maneuvers. Illustrative vertical and horizontal force vectors imparted by rider towline 20 are labeled V and H, respectively, at a distal end or handle 20a of the towline.

The magnitude of the vertical force component typically varies with the angle formed between rider towline 20 and the water surface. As indicated, rider towline 20 may be engaged with bridle line 28 so as to increase this angle. Specifically, rider towline 20 and kite bridle line 28 may be engaged so that a portion of the rider towline is supported at an elevated location, typically at or near bridle line 28. In the depicted example, rider towline 20 may be supported at any one of several different intermediate locations 30a, 30b, 30c and 30d along the length of the kite bridle line. As described below, a specific intermediate location may be selected to increase or decrease the rider towline angle, and thus vary the lift enhancement or vertical force that is provided.

Referring now to Fig. 1 and Figs. 4A, 4B and 4C, Fig. 1 shows towing system 10 in a fully deployed mode, after boat 18 has achieved a desired towing velocity, typically 18-22 miles per hour. The fully deployed mode of system 10 is also shown in Fig. 4C, with Figs. 4A and 4B showing system 10 at rest and at an intermediate speed during

initial acceleration after kite 24 has launched. At rest and during initial acceleration, kite 24 rests or floats on the water surface along with and typically in front of rider 12, though alternate rigging configurations may be used in which the kite is not in front of the rider. During initial acceleration, the rider and kite are pulled across the surface of the water.

5 As discussed below, kite 24 typically is provided with various pontoon type bladders or other float material structures to help the kite to float and plane or skim over the water surface. Various rigging configurations may be employed, though the kite and rider lines typically will be sized so that rider 12 trails behind kite 24 while the kite planes over the water surface (e.g., prior to liftoff of the kite). Other rigging configurations may of  
10 course be employed, depending on considerations such as performance during launching and takedown of kite 24, the desired pulling forces and lift enhancement, etc.

Regardless of the particular configuration, kite 24 typically is designed to skim across the water at relatively low speeds, and then lift off the water surface once threshold wind speed through the kite structure is achieved. Fig. 4B shows system 10  
15 shortly after kite liftoff has occurred. System 10 typically is designed so that kite liftoff occurs when the boat is traveling at a significantly lower velocity than the desired towing speed. For example, if the desired towing speed while wakeboarding is 20 miles per hour, then it may be desirable to design the kite to lift off the water surface when the boat accelerates to 5-15 miles per hour.

20 After kite liftoff, boat 18 continues to accelerate to the desired towing speed typically 18-22 miles per hour, and kite 24 continues to rise upward and behind the boat. Once the desired towing speed is reached, kite 24 is fully deployed in a position above

and behind boat 18 and above and typically in front of the rider 12 (Fig. 4C). The position of the kite relative to the boat when fully deployed will typically depend on various factors, including rigging configuration, weight of the rider, velocity of the boat, relative wind speed, etc.

5           At the end of the towing session, kite 24 typically will glide gradually to the water surface upon slowing of boat 18, at which point the kite will skim across the water for the next deployment of another towing session, or may be reeled in and stowed. Should the kite remain aloft (e.g., due to wind), an auxiliary line operable by the rider or someone within the boat may be used to bring the kite down. For example, attached to the boat  
10   may be an auxiliary take-down line attached to the kite on the other end, so that the kite may be brought down at any time by a boat occupant. The rider, who typically is connected to the system only by towline handle 20a, may disengage from the system at any time by letting go of the towline handle. Additionally or alternatively, a reel mechanism may be employed to reel out and retract kite bridle line 28 as desired.

15           Referring now to Figs. 1 and 2, the elevated support of rider towline 20 will be described in more detail. As discussed above, the rigging configuration in the depicted example supports rider towline 20 at an elevated location to provide lift enhancement. Typically, this elevated location is at a point that is above and to the rear of boat 18, to increase the upward angle at which the towline extends from rider 12. In the exemplary  
20   configurations discussed herein, this is accomplished by supporting a portion of rider towline 20 at an intermediate location (e.g., location 30a, 30b, etc.) along kite bridle line 28 between kite 24 and where the bridle line attaches to boat 18.

Fig. 2 shows an example of how rider towline 20 may be supported at such an intermediate location 30a along the kite bridle line. Support at intermediate location 30a is achieved through a loop 32 attached to kite bridle line 28, with a pulley attached to the loop via a carabiner or like device. Rider towline 20 is received through pulley 34, such that rider towline 20 extends from its distal end / handle 20a (e.g., the end held by rider 12 in Fig. 1), through pulley 34 to proximal end 20b (e.g., attached to boat 18). When system 10 is fully deployed during towing, pulley 34 thus defines the uppermost point of rider towline 20. This elevated location is substantially above and to the rear of boat 18, so that the rider line imparts an enhanced vertical force component V to rider 12. The attachment mechanisms and location points 30a, 30b, 30c, 30d or any other desired point on line 28 may be automatically adjustable for weight of the rider, or mechanically adjustable.

As discussed in more detail below, one or more additional loops may be employed along kite bridle line 28, to provide for adjustment of the rider towline elevated support location. Fig. 1 shows several such loops below location 30a. In such a case, the rider towline may be rigged through one or more of the lower loops, as depicted in Fig. 1, or may be rigged to bypass any or all of those lower loops.

It should be appreciated that various other methods may be employed to engage the rider and kite towlines to provide an elevated support, in addition to or instead of the exemplary pulley arrangement shown in Figs. 1 and 2. Other pulley mechanisms may be employed; for example a reverse pulley system may be used in which the kite bridle line is run through a pulley.

Also, the depicted example has separate lines for both the kite and rider. The separate lines are engaged so as to co-extend for a certain distance away from the boat (e.g., to location 30a, 30b, 30c or 30d), beyond which point the rider line is free to diverge downward and away from the kite bridle line to where it is held by the  
5 wakeboard rider. As a result, a portion of rider towline 20 is pulled upward off the water surface as the kite is flown behind the boat. However, instead of having such an arrangement with separate full-length lines, one or both of the lines may be shortened, so that only a single length of line runs between anchor structure 36 and the point at which the divergent kite and rider lines meet. For example, rider towline 20 may be shortened  
10 so that it extends upward to terminate at an intermediate attachment point on kite bridle line 28. Alternatively, rider towline 20 may be extended to attach at the boat, with the kite bridle line being provided in a shorter segment that connects to an intermediate attachment point on the rider towline.

It can also be appreciated that line 28 may be the only attachment line to the motor  
15 boat 18, and line 20 may be shortened to attach to points 30a, 30b, 30c, 30d or other desired attachment points.

Referring again to Fig. 1, system 10 may be configured to enable adjustment of the amount of vertical lift force provided. Specifically, rider towline 20 may be engaged with kite bridle line 28 at any of several different intermediate support locations 30a, 30b,  
20 30c and 30d along kite bridle line 28, as previously discussed. Exemplary system 10 includes four different support locations, though more or less locations may be employed, as desired.



Typically, the system is configured so that each support location provides different performance characteristics. Specifically, the different locations in the depicted example allow variation of the angle of rider towline 20, and thus variation of the amount of lift force imparted to rider 12 during towing. Locations closer to anchor structure 26 (e.g., location 30d) provide shallower angles for rider towline 20, and thus provide less lift enhancement for the rider. Moving farther away from boat 18, successive intermediate locations 30c, 30b and 30a provide increasingly steeper line angles and thus greater lift enhancement during towing. In the four-location example, the locations may be selected to correspond to suggested rider size/weight, for example small (closest to boat 18), medium, large and extra-large.

Typically, the specific support location for the rider towline is selected based on the desired amount of unweighting, or vertical lifting force  $V$  to be imparted to the rider. This may include empirical determinations that take into account boat speed, kite lift characteristics, line rigging configurations, rider body weight and other factors. Normally, it will be desirable that the system is configured to unweight the rider and thereby enhance jumping ability, without providing a vertical force  $V$  (Fig. 1) sufficient to overcome gravity, or typically less than 1G of vertical lift is desired to gain both an aerial effect and water effect. Accordingly, the lifting mechanism, while enhancing jumping ability and allowing a rider to catch bigger air, typically will not keep the rider aloft indefinitely.

Referring now to Fig. 3, an exemplary kite 40 will be described in more detail. Though various configurations may be employed, kite 40 typically will be configured so

that, when aloft, the kite has significant lateral stability so as to track in the direction boat 18 is traveling. Accordingly, kite 40 will counter lateral pulls by the rider as the rider crosses back and forth across the wake. Also, it will normally be desirable that the kite smoothly and stably lift off when pulled at speeds lower than the anticipated range of towing speeds. In wakeboard applications, 20 miles per hour is a common towing speed, so that the kite should be configured to take flight at a substantially slower speed and be fully deployed and providing significant lift by the time the boat has accelerated to 20 miles per hour.

Referring to the specific features of the depicted example, kite 40 may include a plurality of panels made of ripstop nylon or another suitable material. For example, kite 40 has two outer fin panels 42 and 44 and a center fin panel 46, with two top panels 48 and 50 extending between upper edges of the center and side fin panels. As shown, the panels may be supported with a frame 52 of lightweight rod members, such as carbon fiber, aluminum, or other such structural material rods 54, 56, 58, 60, 62 and 64. The rods may be sewn into the panels, or secured to the panels with snaps, clips, closures or other fastening mechanisms or methods.

The panels of exemplary kite 40 define wind channels 72, which are shaped and otherwise configured to provide tracking and stability during flight. Bleeder holes 75 may be provided in various panels of the kite as needed. One or more bridle line attachment points 74, 76 and 78 may be provided to connect bridle line 28 to the kite. A stabilizing/spreading mechanism 80 may also be provided to space the side panels and maintain structural integrity. In the depicted example, the mechanism includes piston

rods 82 and 84 and angled brace rods 86 and 88. Additionally, or alternatively, kite 40 may be provided with one or more inflatable components, such as air bladders, that are configured to maintain the structure of the kite when inflated. Inflatable components may also be employed to increase flotation of the kite.

5 Referring still to Fig. 3, kite 40 may include base structures adapted to facilitate flotation and planing across the water surface. In particular, the lower base portion of kite 40 includes elongate float runners 90, 92 and 94, which are provided at the bottom edges of outer fin panels 42 and 44 and center fin panel 46. The runners typically are implemented as floats, and are made of hollow plastic, foam or another material to  
10 provide flotation. The runners typically are shaped and aligned to guide the kite over the water surface prior to liftoff, and may be provided with fins or skegs 96 to enhance tracking while the kite is being dragged over the water and/or while in the air.

While the present embodiments and method implementations have been particularly shown and described, it should be understood that many variations may be  
15 made therein without departing from the spirit and scope defined in the following claims. The description should be understood to include all novel and non-obvious combinations of elements described herein, and claims may be presented in this or a later application to any novel and non-obvious combination of these elements. Where the claims recite “a” or “a first” element or the equivalent thereof, such claims should be understood to include  
20 incorporation of one or more such elements, neither requiring nor excluding two or more such elements.